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INSECTS, WORMS, ZOOPHYTES, &c.

THEIR HABITS, FOOD, RETREATS, OCCASIONAL APPEARANCE,
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Remarks on Mr. Frederick Smith's 'Catalogue of British Hymenoptera Aculeata.' By J. C. Dale, Esq., M.A., F.L.S., &c.

Having received several of the Catalogues of Insects of the British Museum, I intend sending you some remarks on them from time to time, and I will commence now with the 'Hymenoptera Aculeata,' by Mr. Smith, to whom I once sent three species, which he did not know in the Formicidæ! One he has described as Myrmica simillima which he commences with, and I have a species named by Mr. Curtis as Formica emarginata, *Ol.* (not mentioned by Mr. Smith), which is common in Portland, on sands, comes pretty near F. flava, *Lat.*, but appears to be distinct. I took two specimens of a Myrmica near Charmouth, July 8th, 1835, one of which I gave to Mr. Curtis, who named it maculipes;* it is the largest species in the genus that I have, and appears to have been winged, as something like the rudiments are left.

Myrmica cæspitum. I took one specimen on the Holyhead Mountain, and another in North Wales.

„ domestica. I had from Mr. Smith, and also from Exeter by Mr. Abraham.

Myrmecina Latreillii. I took one in Cranborne Chace, and a second at Charmouth.

Mutilla Ephippium. July 14th, 1835, I took a large male on Parley Heath, and a female in the Isle of Wight.

Myrmosa melanocephala and Tengyria ichneumonides, July 15th, at Lulworth and Charmouth.

Tiphia minuta. March, 1818, on laurels at Glanville's Wootton.

Sapyga 5-guttata. Blandford and Ambleside.

Ceropales maculata. One at Glanville's Wootton. In plenty at Parley.

Aporus bicolor. Male and female. On a sand-bank, Parley Heath.

„ unicolor. I took two specimens; one at Middlemarsh, June, 18th, 1835, one of which I gave to Mr. Thwaites. Mr. Smith does not record this as a species.

Sphex spinifex? Near Peterborough, according to Barbut.

Astata boops. Near Wareham and Stourton Caundle.

Oxybelus nigro-æneus? Bourne Mouth, Hants.

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* Vide Linn. Trans. vol. xxi. p. 216.

BRITISH MUSEUM

Alyson lunicornis. Male. Glanville's Wootton.

Eumenes coarctata. I bred one from Parley Heath.

Vespa crabro and vulgaris. Come to sugar on moonlight nights.

Halictus 4-cinctus. Portland; one only.

„ prasinus. Bourne Mouth, Hants (*not* Wales, as recorded).

Andrena hæmorrhoidalis. Between Dawlish and Teignmouth.

„ analis. June 17th, 1842, Holnest, Dorset.

„ Coitana. Parley and Killin, July 20th, 1825.

„ Cetii. On Scabious flowers by Moore's River, Hurne and Parley.

„ distincta and nigriceps, Parley and Bourne Mouth.

„ Aprilina. Glanville's Wootton, April and May, 1835 (*not* Bourne Mouth, as recorded).

„ argentata. Parley and Bourne Mouth.

Cilissa hæmorrhoidalis and tricincta. Parley Heath.

Dasypoda hirtipes. Muddiford, Hants.

Megachile Leachella. Portland and Bristol.

Nomada baccata. Ramsdown and Bourne Mouth.

„ borealis and Roberjeotiana. Parley Copse, Elsington Wood and gravel-pits, Holm Bushes, near Holnest, Dorset.

Cælioxys 4-dentata. One at Glanville's Wootton; in plenty at Hurne, &c.

„ rufescens. On mud-wall, Stilton, Hunts.

„ vectis. Portland.

Saropoda vulpina. Male. Parley.

„ furcata. Male. Middlemarsh.

Apathus rupestris. Glanville's Wootton.

Bombus fragrans. Isle of Arran.

„ Skrimshiranus. Lulworth.

„ subterraneus. New Forest.

Cleptes semiaurata. Glanville's Wootton.

„ nitidula. Great Yarmouth.

Chrysis Ruddii. On rocks in Portland.

„ ornatrix. I saw one on a sand-bank in the New Forest.

„ bidentata. One at Glanville's Wootton; in plenty at Parley, &c.

„ succincta. West Hurne, Bourne Mouth and Lulworth.

„ cyanea. Rare at Glanville's Wootton.

„ austriaca. Glanville's Wootton.

„ neglecta. Portland.

Hedychrum ardens. Lulworth, Portland.

„ n. s.? (allied to æneum). Blandford, and near Barnstable.

Elampus Panzeri, Portland Sands by Chesil Bank.

Chrysis austriaca. Glanville's Wootton, Powerstock, and Cambridge.

J. C. Dale.

Glanville's Wootton,
June, 1854.

Researches on the Development of Viviparous Aphides.

By Waldo T. Burnett, M.D.*

Every naturalist is aware of the remarkable phenomena connected with the viviparous reproduction of Aphides or plant-lice, for their singularity has led them to be recounted in works other than those of natural science, and, from the days of the earlier observers, they have been the theme of a kind of wonder-story in zoology and physiology.

I need not here go over the historical relations of this subject. The queer experiments and the amusing writings of the old entomologists are well known. The brief history of the general conditions of the development of these insects is as follows:—In the early autumn the colonies of plant-lice are composed of both male and female individuals; these pair, the males then die, and the females soon begin to deposit their eggs, after which they die also. Early in the ensuing spring, as soon as the sap begins to flow, these eggs are hatched, and the young lice immediately begin to pump up sap from the tender leaves and shoots, increase rapidly in size, and in a short time come to maturity. In this state it is found that the whole brood, without a single exception, consists solely of females, or rather, and more properly, of individuals which are capable of reproducing their kind. This reproduction takes place by a viviparous generation, there being formed in the individuals in question young lice, which, when capable of entering upon individual life, escape from their progenitor, and form a new and greatly increased colony. This second generation pursues the same course as the first, the individuals of which it is composed being, like those of the first, sexless, or at least without any trace of the male sex throughout. These same conditions are then repeated, and so on almost indefinitely, experiments having shown that this power of reproduction under such circumstances may be exercised, according to Bonnet, at least through nine generations, while Duvau obtained thus eleven generations in seven months, his experiments being curtailed at this stage, not by a failure of the reproductive power, but by the approach of winter, which killed his specimens; and Kyber even observed that a colony of Aphis Dianthi which had been brought into a constantly heated room, continued to propagate for four years, in this manner, without the intervention of males, and even in this instance it remains to be proved how much longer these phenomena might have been continued.

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* Extracted from Silliman's Journal for January, 1854.

The singularity of these results led to much incredulity as to their authenticity, and on this account the experiments were often and carefully repeated, and there can now be no doubt that the virgin Aphis reproduces her kind, a phenomenon which may be continued almost indefinitely, ending finally in the appearance of individuals of distinct male and female sex, which lay the foundation of new colonies in the manner just described.

The question arises, what interpretation is to be put upon these almost anomalous phenomena? Many explanations have been offered by various naturalists and physiologists, but most of them have been as unsatisfactory as they have been forced, and were admissible only by the acceptance in physiology of quite new features.

As the criticism I intend to offer upon some of these opinions will be better understood after the detail of my own researches, I will reserve their future notice until the concluding part of this paper.

My observations were made upon one of the largest species of Aphis with which I am acquainted, the Aphis Caryæ of Harris. While in Georgia this last spring, it was my good fortune that myriads of these destroyers appeared on a hickory which grew near the house in which I lived. The number of broods on this tree did not exceed three, for with the third series their numbers were so great that their source of subsistence failed, and they gradually disappeared from starvation. The individuals of each brood were, throughout, of the producing kind, no males having been found upon the closest search; they were all, moreover, winged; and those few that were seen without these appendages appear to have lost them by accident. I mention this fact especially, since it has been supposed by naturalists that the females were always wingless, and therefore that the winged individuals or the males appeared only in the autumn.

The first brood, upon their appearance from their winter hiding places, were of mature size, and I found in them the developing germs of the second brood quite far advanced. On this account it was the embryology of the third series or brood alone that I was able to trace in these observations.

A few days after the appearance of these insects, the individuals of the second brood, (B) still within their parents (A), had reached two-thirds of their mature size. At this time the arches of the segments of the embryo had begun to close on the back, and the various external appendages of the insect to appear prominently; the alimentary canal had been more or less completely formed, although distinct abdominal organs of any kind belonging to the digestive system were not very prominent. At this period, and while the individuals of generation B are not only in the abdomen of their parent (A), but are also enclosed, each, in its primitive egg-like capsule,—at this time, I repeat, appear the first traces of the germs of the third brood (C).

These first traces consist of small egg-like bodies, arranged two, three or four in a row, and attached in the abdomen at the locality where the ovaries are situated in the oviparous forms of these animals.

These egg-like bodies consisted either of single nucleated cells, of $\frac{1}{3000}$th of an inch in diameter, or a small number of such cells enclosed in a simple sac. These are the germs of the third generation: they increase with the development of the embryo in which they have been formed; and this increase of size takes place, not by a segmentation of the primitive cells, but by the endogenous formation of new cells. After this increase has gone on for a certain time, these egg-like bodies appear like little oval bags of cells; all these component cells being of the same size and shape, there being no cell which is larger and more prominent than the rest, and which could be comparable to a germinative vesicle. While these germs are thus constituted, the formation of new ones is continually taking place. This occurs by a kind of constriction-process of the first germs, one of their ends being pinched off, as it were, and in this way what was a single sac is changed into two which are attached in a moniliform manner. The new germ thus formed may consist of even a single cell only, as I have often seen, but it (the germ) soon attains a more uniform size by the endogenous formation of new cells within the sac by which it is enclosed. In this way the germs are multiplied to a considerable number, the nutritive material for their growth being apparently a fatty liquid with which they are bathed, contained in the abdomen, and which is thence derived from the abdomen of the first parent.

When these germs have reached the size of $\frac{1}{300}$th of an inch in diameter, there appears on each, near one end, a yellowish vitellus-looking mass or spot, which is composed of large yellowish cells, which in size and general aspect are different from those constituting the germ proper. This yellow mass increases *pari passu* with the germ, and at last lies like a cloud over and concealing one of its poles. I would also insist on the point that it does not extend itself gradually over the whole germ-mass, and is therefore quite unlike a true germinative vesicle or a proligerous disk. When the egg-like germs have attained the size of $\frac{1}{150}$th of an inch, there distinctly appears the sketching or marking out of the future animal. This sketching consists at first of delicately marked retreatings of the cells here and there, but which soon become more prominent from furrows, and at last the whole form of the embryo stands boldly out. As the whole idea and form of the insect is thus moulded out of a mass of cells, it is evident that the separate parts which then appear, such as the arches of the segments, the extremities and the oval apparatus, consist at first only of rows of simple cells. This point is here beautifully prominent, and nowhere have I observed finer illustrations of the cell-constitution of developing forms. The development thus proceeding, each part of the dermo-skeleton becomes more and more distinct, and the increase of size of the whole is attained by the constant development of new cells. During this time the yellow vitellus-looking mass, situated at one of the poles of the embryo, has not changed its place; it has increased somewhat in size, but otherwise appears the same. When the development has proceeded somewhat further, and the embryo is pretty well formed, the arches of the segments, which have hitherto remained gapingly open, appear to close together on the back, thereby enclosing this vitellus-looking mass within the abdominal cavity.

It is this same vitelloid mass thus enclosed that furnishes the nutritive material for the development of new germs, which would be those of the fourth brood or D: this development of germs here commences with the closing up of the abdominal cavity, and the same processes which we have just described are again repeated.

The details of the development subsequent to this point are like those of the development of ordinary insects, or of the Articulata in general; and although this ovoid germ has at no time the structural peculiarities of a true ovum, such as a real vitellus, a germinative vesicle and germinative dot, yet, if we allow a little latitude in our comparison and regard the vitellus-looking mass as the *mucous*, and the germ-mass proper as the *serous* fold of the germinating tissue, as in true eggs,—if, I repeat, we can admit this comparison of parts, then the analogy of development between these germs and true eggs of insects may be traced in considerable detail.

This comparison I have been inclined to admit, at least in part, from the striking resemblance of these developing forms at certain stages, with the embryological forms of spiders as they have been figured by Herold, and as I have myself traced them. When in spiders, the serous fold of the germinating tissue has extended so as to cover two-thirds of the developing form, leaving the vitelline mass on the dorsal surface near one of the poles, the whole embryo quite resembles that of a developing Aphis just before the arches of the segments close up on the back.

With this view of the relative parts of the germ, the following would be the details of the development of the different systems, and in the noticing of which I shall follow Kolliker.

1. The germinating tissue consists of two parts; a serous and mucous fold.
2. The abdominal plates arise from the serous fold, sprout out towards the vitelloid mass, pass over it, and unite on the dorsal surface of the future animal; on the opposite side are formed plates which do not unite, but are formed into the hind legs.
3. The wings are lateral limbs.
4. The first traces of the abdominal column appear in the chain of abdominal muscles situated between the nerves and the intestinal canal.
5. The nervous system in all its parts arises from the serous fold, as well also as the organs of sense.
6. The mucous fold, or the vitellus-looking mass serves no purpose in the formation until the closing in of the visceral plates.
7. Thus enclosed in the abdominal cavity, it is not transformed directly into the intestinal canal, but simply furnishes the material from which the component cells of the said canal and its hepatic diverticula are formed. It also furnishes the material from which the new germs are formed, as already shown.

8. The heart is formed on the dorsal aspect between the mucous and serous folds. In this way the details of development closely correspond with those of the embryology of the other Articulata which I have studied; and the subject is all the more interesting, as the germ-masses from which such development occurs in no way and at no time structurally resemble true eggs.

When the embryo is ready to burst from its developing capsule and make its escape from the abdomen of its parent, it is about one-sixteenth of an inch in length, or more than eight times the size of the germ at the time when the first traces of development were seen. From this it is evident that, even admitting that these germ-masses are true eggs, the conditions of development are quite different from those of the truly viviparous animals; such as, for instance, in Musca, Anthomyia, Sarcophaga, Tachina, Dexia, Miltogramma, and others among Dipterous insects, or in the viviparous reptiles,—for in all these cases of ordinary viviparity, the egg is simply hatched in the body instead of out of it. The egg, moreover, is formed exactly in the same way as though it was to be deposited, and its vitellus contains all the nutritive material required for the development of the egg until the coming forth of the new individual. The abdomen of the mother serves only as a proper nidus or incubatory pouch for its full development. This is true of all the ovo-viviparous animals whatsoever. With the viviparous Aphides, on the contrary, the developing germ derives its nutritive material from the fatty liquid in which it is bathed, and which fills the abdomen of the parent. The conditions of development here, therefore, are more like those in Mammalia, and the whole animal may, in one sense, be regarded as an individualised uterus filled with germs; for the digestive canal, with its appendages, seems to serve only as a kind of laboratory for the conversion of the succulent fluids which the animal extracts from the tree on which it lives, into this fatty liquid from which the increase and development of the germs take place.

When the young animal has reached its full development as an embryo, it bursts from its encasement and appears to escape from the abdomen of its parent through a small opening (*porus genitalis*) situated just above the anus. In the species under consideration, it generally remains clinging on the back of the parent until its external parts are dry, and it is able to begin life for itself. Each parent here produces from eight to twelve individuals, and if this rapid increase is continued undisturbed, through seven to nine broods, we cannot wonder at the countless numbers which appear from so few original individuals.

Such are the details of the embryological development of the so-called viviparous Aphides, as far as I have enjoyed opportunities for their study. We will now refer for a moment to the special points which have here been made out. In the first place it is evident that *the germs which develope these forms are not true eggs.* They have none of the structural characteristics of eggs, such as a vitellus, a germinative vesicle and dot; on the other hand, they are at first simple collections, in oval masses, of nucleated cells.

Then again, they receive no special fecundating power from the male, as is the necessary preliminary condition of all true eggs; and, furthermore, the appearance of the new individual is not preceded by the phenomena of segmentation, as also is the case with all true eggs. Therefore their primitive formation, their development, and the preparatory changes they undergo for the evolution of the new individual, are all different from those of real ova. Another point is, *these viviparous individuals have no proper ovaries and oviducts.* Distinct organs of this kind I have never been able to make out. The germs are situated in moniliform rows, like the successive joints of confervoid plants, and are not enclosed in a special tube. These rows of germs commence each by a single germ-mass which sprouts from the inner surface of the animal, and which increases in length and in the number of its component parts from the successive formation of new germs by a constriction-process as already mentioned. Moreover, these rows of germs, which, at one period, closely resemble in general form the ovaries of some true insects, are not continuous with any uterine or other female organ, and therefore do not at all communicate directly with the external world. On the other hand, they are simply attached to the inner surface of the animal, and their component germs are detached into the abdominal cavity as fast as they are developed, and then escape outwards through a *porus genitalis,* exactly as is the case with the eggs of fishes. Here, then, comes the important question, What interpretation shall we put upon these reproductive parts—these moniliform rows of germs?

Ignoring all existing special theories relating to reproduction, the observing physiologist would be left no alternative but to regard them as *buds,* true gemmæ, which sprout from the inner surface of the Aphis, exactly like the buds from the external skin of a Polype.

Before proceeding to a discussion of the relations of this important conclusion to which we have just arrived, it may be well to refer to the views of others upon the exact signification of these singular reproductive phenomena.

Those old entomologists, such as Bonnet, Réaumur, De Geer, &c. who were the first to observe, besides verifying beyond all doubt, these peculiar phenomena, all believe that each brood constitutes a separate generation and that the reproduction takes place by true ova, as in the common generative act of other insects. This wide deviation from the ordinary course of nature, as it seemed to them, they attempted to explain and reconcile by various theories. Thus Réaumur affirmed that these viviparous individuals were androgynous; and, in later times, Léon-Dufour, who knew too well the anatomical structures of insects to believe with Réaumur that they could be hermaphrodites, referred these phenomena to spontaneous or equivocal generation.

Morrem, who made somewhat extended researches on the anatomy of Aphis Persicæ, and especially of its generative organs, advanced the novel theory that these broods were developed in the body of the virgin parent, by a previously organized tissue becoming individualised and assuming an independent life, exactly as he believed to be the case with Entozoa. To each and all of these views it scarcely need be said that they would be wholly inadmissible, according to the present established doctrines of physiological science, even had we no directly controverting observations.

But there are other explanations or views which deserve more attention. The first of these is that advanced by Kirby and Spence. According to them, "One conjunction of the sexes suffices for the impregnation of all the females that in a succession of generations spring from that union." In support of the reasonableness of this hypothesis, they quote several instances which they regard as of analogous character; thus they say, in regard to the hive-bee, that "a single intercourse with the male fertilizes all the eggs that are laid for the space of two years."

In this connection should be mentioned the similar hypothesis advanced for a like purpose by Jourdan. According to him many Lepidoptera lay fertile eggs when completely isolated from the males; such are Euprepia casta, Episema cæruleocephala, Gastropacha potatoria, G. Quercifolia and G. Pini, Sphinx Ligustri, Smerinthus Populi, and Bombyx Querci.

But all these cases have really no strict analogy with that of the Aphides in question; for there is not, as with these last, a succession of innately fertile individuals, but only females which are capable of producing several broods from a single coitus, or after having been long removed from the males, which may even then be dead. Late researches upon the minute anatomy of the generative organs of insects have furnished results by which these phenomena, seemingly strange at first, can be explained. All these insects which are thus capable of laying fecundated eggs again and again after the first impregnation have a *receptaculum seminis* connecting with the oviduct, in which the semen is deposited during coition, and where it may be preserved without losing its vitalizing power for several months. Thus, by this provision the males, having copulated with the females in the autumn, may immediately die, while these last, hybernating, produce in the spring fertile ova; and in the instance of the Bombus americana such a coition suffices for all the three broods which are produced the ensuing summer.

Another explanation of these curious phenomena, and which has attracted some attention, as well from its singularity as from the eminence of its propounder, is that of Owen, advanced in his Hunterian Lectures in 1843.

He affirms that the larval Aphides are productive, in virtue of the successive continuation from brood to brood, of a portion of the primitively fertilized germ, and which material product or leaven is not exhausted until nine to eleven generations. I will quote his own language.

"In the Aphides, the corresponding vitelline cells retain their share of the fecundating principle (which was diffused through the parent egg by the alternating, fissiparous, liquefactive and assimilative processes) in so potent a degree, that a certain growth and nutritive vigour in the insect suffice to set on foot in the ovarian nucleated cells a repetition of the fissiparous and assimilative process, by which they transform themselves in their turn into productive insects; and the fecundating force is not exhausted by such successive subdivision until a seventh, ninth or eleventh generation."

This same doctrine, the successive inheritance of a portion of the primary germ-mass from brood to brood, and by means of which the fertile germs are continued,—this doctrine, I say, is repeated in full in this author's work on Parthenogenesis, and I will here quote one sentence, not only in illustration of this, but to show how different his own observations on the development of these animals are from mine just described. He says, "One sees such portion of the germ-mass taken into the semitransparent body of the embryo Aphis, like the remnant of the yolk in the chick. I at first thought it was about to be enclosed in the alimentary canal, but it was not so. As the embryo grows it assumes the position of the ovarium, and becomes divided into oval masses and enclosed by the filamentary extremities of the eight oviducts. Individual development is checked and arrested at the apterous larval condition. It is plain, therefore, that the essential condition of the development of another embryo in this larva is the retention of part of the progeny of the primary impregnated germ-cell."

This view of Owen, so ingeniously advanced, and which he has made subservient for the chief support of his new doctrine of Parthenogenesis, is indeed plausible, and seems at first satisfactory; but, as I hope to show, it will not bear analysis.

In the first place, it is evident that Owen does not recognise any physiological difference between a bud and an ovum: this is clear from what he remarks in the first quotation, but in his work on Parthenogenesis he has said so in as many words. "The growth by cell-multiplication producing a bud, instead of being altogether distinct from the growth by cell-multiplication in an egg, is essentially the same kind of growth or developmental process." Here is a fundamental error, which if not removed will obscure all our views of the physiology of reproduction. I have already insisted upon the necessity of this broad distinction between these two forms,—a necessity based not only upon differences of anatomical constitution, but also upon physiological signification. An *ovum* is the exclusive product of an individual of the female sex, and is always formed in a special organ called the ovary. It is the particular potential representative of the female, and has its ulterior development only from its conjunction with a corresponding element of the opposite or male sex; and Zoology presents no instance where there is development from eggs unless these conditions of the two sexes are fully carried out. A *bud*, on the other hand, is simply an offshoot from the form on which it rests, a portion of the animal capable of individual development. It sustains, therefore, no relations to sex, and, in truth, is widely separated in its ulterior signification from that cycle of processes conceived in a true oviparous reproduction. All physiologists who have carefully studied embryological and developmental processes must feel the correctness and importance of this distinction, which lies in realities and not in words. It is true that a bud and an ovum are composed each of the same elements,—simple nucleated cells; but in one these cells are simply in a mass, while in the other they have throughout the animal kingdom, high or low, a definite and invariable arrangement. Then again as to the constitution of each and both being on the whole of nucleated cells, it may be said that it could hardly be conceived to be otherwise, for nucleated cells are the elementary components of all functional organized forms; and it may be added, moreover, that he knows little of the highest physiology who has not learned that widely different teleological significations may be concealed beneath isomorphic animal forms.

I have thus dwelt rather lengthily upon this point, because I think it is a vital one in our subject, and the possession of clear ideas thereon will be found singularly conducive to our correct appreciation of the whole class of anomalous phenomena under discussion. But we will revert to the subject of Owen's hypothesis.

As to the chief point in this hypothesis, the continuation of the primary germ-mass as a leaven, from brood to brood, it requires but little thought to perceive that it is physically impossible. I would first allude to Owen's statement, quoted above, that a portion of the germ-mass is taken into the abdomen of the embryo Aphis, and, as he thinks, assumes, without any change, the position of the ovarium. By this he refers, undoubtedly, to the vitellus-looking mass I have described in my observations, and according to which, also, it appeared to serve only as the nutritive material out of which the digestive organs and the germs are formed. Moreover, I feel quite sure that the germ-cells are new cells formed in the abdomen, and not those derived from the parent. But the point I wish to enforce is, that even admitting that individuals B may contain an *actual residue* of individuals A, it is clearly evident that this succession must stop with brood B; for these residual germ-cells which compose B in its earliest condition are lost in the developmental processes, and the germs of individuals C, which are found in B, are each, primarily, nucleated cells formed *de novo*, as I have observed, and above described. With these observed conditions of development, it is impossible for the individuals of the successive broods to inherit the original spermatic force in the continuation of the original cells.

The hypothesis of Owen, therefore, plausible and ingenious as it may seem, does not appear to me to accord either with observed facts or with the soundest physiology of the reproductive processes. I may here remark, also, that his doctrine of Parthenogenesis, based as it is upon the conditions of the hypothesis in question, cannot, as such, be sustained, for the same reasons, and all its phenomena would appear to find their solution either in Steeenstrup's doctrine of "Alternation of Generations," so called, or in the conditions of true gemmiparity, —admitting, provisionally, that Steenstrup's doctrine and gemmiparity include really different physiological conditions.

But the most important explanation advanced, and the last which I shall notice, is that offered by Steenstrup in his doctrine of the "Alternation of Generations," and of which it forms a chief support. The details of this peculiar doctrine of Steenstrup I need not here furnish; they are well known to all physiological anatomists. Its features, however, may be expressed in a formula-like manner. Individuals A produce true fecundated eggs, from which are hatched individuals B, which are unlike their parents in all zoological respects, but in which are developed spontaneously, and without any reference to sex, germs which ultimately become individuals like A, and so the cycle of development is completed. These intermediate individuals, B, Steenstrup has termed nurses (*Amnen*), and he regards them as distinct animals subservient for a special end; he therefore considers that B constitutes a real generation.

Instances of such phenomena are found in the lower orders of the animal kingdom — Polyps, Acalephs and Worms; and late research has shown that they are more or less common throughout the whole of the Invertebrata.

The difference between alternation of generation and metamorphosis is too marked to require illustration: in the latter there is the same individual throughout, and the developmental processes, although concealed beneath different exteriors, are regular and normal; with the former, however, this chain of development is broken by one form being developed in another, this intermediate form serving as a stepping-stone for a higher and ulterior development. Another important point in this alternate reproduction is, that in each new change some real progress is made, the nursing-form being manifestly inferior to the individual to which it gives rise.

Steenstrup regards the Aphides as furnishing the most perfect examples known of nursing individuals, and, on the whole, as constituting typical illustrations of the doctrine he has advanced.

But if this doctrine implies conditions other than those which belong to true gemmiparity, it does not appear to me that it has any support in the phenomena in question of the Aphides. And although I am inclined to believe, as I shall soon show, that all these phenomena, essentially, may be of the same nature, yet there can be no doubt that the manifestations are here somewhat peculiar. With the Aphides there is real morphological progress made in each brood, for the viviparous individuals are, zoologically, as perfect in every way as those which are oviparous, except in their want of true sexual generative organs. I have shown that, in the one species here described, they had well-developed wings like the true sexual individuals. Moreover, each brood, from the first to the last inclusive, is merely a repetition of the same. But these conditions are external and economical, and, instead of offering these prominent examples as evidence against the validity of Steenstrup's doctrine, I would rather present them as broadly indicating that, after all, this doctrine in question involves no conditions excepting those belonging to a modified form of gemmiparity. All the instances of Polyps, Acalephs, Worms, Insects, &c., would then be classed in the same category, and the variations in manifestation would belong rather to the economical relations of the animal than to any intrinsic difference of physiological process. Thus the Distoma-nurses, instead of being developed to a condition resembling at all their parent, remain persistent on a low form; and not only is their whole zoological character undeveloped, but they also experience morphological changes from the developmental process which immediately goes on within them. All this is in perfect keeping with their economy as animals, for the low order of their conditions of life does not necessitate a higher and more truly zoological form of these nurses from which are to be developed the true animals: were it otherwise, I cannot but believe that both the nurses and the grand nurse of Distoma would quite resemble the original animals. In the case of the Aphides, the economical conditions are different, and finally illustrate this point.

The Aphis-nurse, in virtue of its very typical structure as an insect, must live under higher conditions, and so its development, zoologically, proceeds to a corresponding point: this point is where it, as an insect and as an Aphis, can furnish the nutritive material for the development of its endogenous germs.

Herein, then, would appear to consist the prominent morphological differences observed in this category of phenomena, and I need not labour further to show that they are irrelevant of the primary essential conditions of these curious processes.

Such appears to me to be the highest, both physiological and zoological, interpretation that can be advanced for these phenomena which Steenstrup has so ingeniously collected and collated; and to advance the view that these intermediate individuals or nurses are not intrinsically and zoologically the same as their parents, but furnish examples of how dissimilar animals may arise from a common stock,

—to put forth this view, I say, is to advocate a doctrine in physiology as mischievous as it is deeply erroneous. I think, therefore, that the doctrine of Steenstrup may prove to be unfounded as far as it would involve, intrinsically, new phenomena in the processes of reproduction; and, as I have said on a preceding page, all its conditions may find their illustration and solution in the various phases of gemmiparity.

If, in this discussion of some of the highest relations of physiology, we have not wandered too far from our subject proper, which we have thereby sought to illustrate indirectly, we will revert to the thread of its discourse for a few concluding remarks.

The final question now is, what is the legitimate interpretation to be put upon the reproductive phenomena of the Aphides we have described? My answer to this has been anticipated in the foregoing remarks. I regard the whole as constituting only a rather anomalous form of gemmiparity. As already shown, the viviparous Aphides are sexless: they are not females, for they have no proper female organs, no ovaries and oviducts. These viviparous individuals, therefore, are simply gemmiparous, and the budding is here internal instead of external as in the Polyps and Acalephs; it moreover takes on some of the morphological peculiarities of oviparity; but all these dissimilar conditions are economical and extrinsic, and do not touch the intrinsic nature of the processes concerned therein.

Viewed in this way, the different broods of Aphides cannot be said to constitute as many true generations, any more than the different branches of a tree can be said to constitute as many trees; on the other hand, the whole suite, from the first to the last, constitute but a single true generation. I would insist upon this point as illustrative of the distinction to be drawn between *sexual* and *gemmiparous* reproduction. Morphologically they have, it is true, many points of close resemblance; but there is a grand physiological difference, the true perception of which is deeply connected with our highest appreciation of individual animal life. A true generation must be regarded as resulting only from the conjugation of two opposite sexes—from a sexual process in which the potential representations of two individuals are united for the elimination of one germ. This germ-power may be extended by gemmation or by fission, but it can be formed only by the act of generation, and its play of extension and prolongation by *budding* or by division must always be within a certain cycle, and this cycle is recommenced by the new act of the conjugation again of the sexes. In this way the dignity of the ovum as the primordium of all true individuality is maintained; and the axiom of Harvey, *omne vivum ex ovo*, stands as golden in physiology. The buds may put on the dress and the forms of the ovum, but these resemblances are extrinsic, and in fact only an inheritance from their great predecessor.

These phenomena, thus interpreted, furnish an excellent key to many others which have long been regarded as anomalous in the history of development.

I refer here to the so-called hybernating eggs (*Wintereier*) which are found in many invertebrates. These I have not seen, but they have been carefully described by several very trustworthy observers. These so-called eggs consist of oval masses or cells invested with a capsule, but in which no germinative vesicle and dot have ever been seen. Structurally, therefore, they do not resemble eggs, and it is from their form and ulterior development only that they have received this name. Moreover, they sustain none of the usual relations of eggs to the sexual organs, and, as far as I am aware, no one has witnessed their development in the ovaries. These bodies have been observed in Hydatina and Notommata among the Infusoria; in Lacinularia among the Rotatoria; and in Daphnia among the Crustacea. In all these instances they hatch without the aid of the male, the existence of which sex was once doubted from its unfrequent appearance.

Now I regard these hybernating eggs as merely egg-like *buds* exactly corresponding to the germs of the viviparous Aphides. In other words, there are in the animals I have just mentioned certain individuals which reproduce by buds which are developed under rather anomalous conditions; and I will add, in conclusion, that I suspect that this gemmiparous mode of reproduction will be found to be far from uncommon among most of the Invertebrata, when our researches into the history of their development shall have been more widely extended.

P.S. Since the publication of this paper, I have enjoyed the opportunity of making this series of investigations more complete, by an examination of the terminal or last brood, which appears at the end of autumn.

This terminal brood has hitherto been considered, as far as I am aware, to be composed exclusively of males and females, or, in other words, of perfect insects of both sexes. I was surprised, therefore, on examining the internal organs of the non-winged individuals, to find that many of these last were not females proper, but simply the ordinary gemmiparous form already described. Moreover, so great was the similarity of appearance between these two forms — true females and gemmiparous individuals—that they could be distinguished only by an examination of their internal genitalia. Among the proper females there were, besides those which were filled with eggs or had already deposited them, other individuals in which the ovaries were but feebly developed, or, at least, in which no mature eggs had been formed. An opportunity was thereby afforded me to examine the structural differences between the true ovaries and their *quasi* representatives, the bud-like processes. The true ovaries had their usual well-known structure, multilocular tubes containing nucleated cells, which are probably the undeveloped germs; the bud-like processes, on the other hand, consisted of a row of cell-masses, oval and connected by a kind of peduncle, as described in detail in the preceding paper. These wide differences have, more than ever, persuaded me of the morphological dissimilarity of these two kinds of reproducing parts in this animal. It seems to me, then, that the real intrinsic difference between an ovum and a bud lies as deep as the conditions of sex itself, notwithstanding the latter often has, as in the present case for instance, some of the morphological characteristics of the former.

The appearance of sexless gemmiparous individuals in the terminal brood would seem to indicate, moreover, that the conditions which determine the appearance of individuals, usually exclusively male and female, are not, perhaps, referable to the fact of this being the last brood, but rather to relations of warmth and nutrition. This view is rendered more probable by the fact of the variation in the number of broods between the first and last, observed in the same species in different years, ranging between seven, nine, eleven or more. Moreover, Kyber, as quoted already in the preceding paper, by nursing continually in a warm room a collection of Aphis Dianthi, keeping about them a summer temperature, succeeded in continuing uninterruptedly the series of sexless or gemmiparous individuals for four years. There are many other facts in insect life that indicate in like manner some direct relation between temperature and nutriment and definite sexual development. The subject is as important as it is interesting in physiology, and these very animals will perhaps subserve the successful study of the primary morphological conditions of sex.

On the Application of Cyanide of Potassium to Killing Insects for the Cabinet. By G. B. Buckton, Esq.

Although the subject of the following paper was recently introduced to the notice of the Natural History section of the British Association, possibly a few words on the same point may not prove unacceptable to the readers of the 'Zoologist.'

Notwithstanding the able manner in which Messrs. Kirby and Spence have answered the objections made by some against the collector, on the score of cruelty, a disinclination, to discuss the less pleasing, but necessary operation of the entomologist. of depriving of life those insects required for future examination, appears to have been felt, since few writers, and they very slightly, touch upon the subject. In the event of obtaining a large Lepidopterous insect (we will suppose it a Death's-head) and confining it under a tumbler, it is not perhaps obvious to all how the creature is best disposed of. A decent and effective plan is a desideratum, and such I beg to propose in the following remarks. Previously, however, to describing a simple apparatus which I have found to answer all requirements, and which is applicable to nearly all cases, I will say a few words upon a method that may be employed when circumstances prevent the adoption of a better.

All insects may be killed by exposing them to a moist atmosphere, at a high temperature. This condition is best obtained by confining them in what may be described as a hot water diving-bell.

A bell of thin and well-annealed glass is furnished within and at its summit with a strip of cork, upon which the insect may be pinned. In broad daylight this may often be readily accomplished, for then the Noctuidæ and other night-flying moths are asleep on dark palings and in other retired situations.

With a little address, a sharp-pointed needle may be thrust through the thorax of the insect to the support on which it stands, which treatment strangely appears to affect it so slightly as scarcely to cause it to lift its wings. Sometimes they will remain in this constrained position quietly until the time arrives for the flight of that particular species, at which period they become restless, and strive to escape; an immediate transfer of the insect and needle to the bell is, however, desirable. The apparatus is then placed mouth downwards in a basin of water, at or near its boiling point, when it will be found that the heat of the expanded air within the instrument produces almost immediate suffocation. A head of sealing-wax should be fixed to the needle, to prevent the insect fluttering off the cork support into the water.

This plan answers well for all specimens bred in confinement or otherwise well placed for operation, but it is nearly useless in collecting Tortrices, Tineidæ, or other minute insects which require delicacy in handling.

From the fact, proved by experiment, that the vapour of hydrocyanic acid diffused through a bell jar is very deleterious to insects, and the consideration that there are many obvious objections to the common use of so volatile and deadly a poison, I have been led to search for a solid compound of cyanogen sufficiently powerful in its properties for such a purpose, yet more portable and less dangerous than the acid itself. These desiderata are to be found in cyanide of potassium, which has the peculiar advantage of being slowly decomposed by moisture (that of the atmosphere is sufficient) into hydrocyanic acid, ammonia, and other products.

The apparatus necessary is very simple, and consists of a wide-mouthed glass jar or bottle, fitted with a brass cup, having an aperture capable of being pretty accurately closed by a slide. The jar is furnished with a false bottom of cloth or blotting-paper, under which from twenty to thirty grains of the cyanide are placed in coarse powder. The blotting-paper serves to absorb any moisture which may arise from the deliquescent nature of the salt. After the lapse of a short time a poisonous atmosphere is produced, which may be retained with all its efficacy for several weeks, without the necessity of renewing the charge of cyanide. A small glass bell and card complete the instrument, which may be taken into the fields, and made to take the place of a collecting-box. A transfer of an insect from the net is easily effected, by capturing it first in the bell glass with assistance of the card. After placing the whole on the cap of the instrument, the card and slide are removed, when the insect drops through the aperture and is suffocated in a space of time varying from forty seconds to two minutes. The apparatus is then free for another operation.

I am aware that many of the advantages here described are to be found equally in the use of crushed laurel-leaves, the vapour of which contains pure hydrocyanic acid. The convenience of the new over the old plan may be thus stated. The fresh leaves are not always to be procured, and the bruised mass after a short time loses its poisonous property: the leaves cannot, therefore, be stored for future use. On the other hand, the cyanide of potassium is retentive of its properties, inexpensive, and may be kept any length of time in stoppered bottles,—recommendations which will be appreciated by the foreign collector.

Little or no fluttering is observed during subjection to the vapour, and the insect may remain with advantage for some time under its action, as the muscles thus become supple and more manageable for setting.

A small phial for the pocket, furnished as above, will prove a great help to those studying the Micro-Lepidoptera, as by its means specimens may be obtained microscopically perfect.

The Hymenoptera and Diptera are peculiarly sensitive to this subtle poison. They generally begin to clean and plume their antennæ (perhaps an argument in favour of those who consider that the olfactory nerves are placed in those organs), intoxication then seizes the insects, they turn on their backs, and lastly a violent spasm affects the muscles of the wings, which vibrate very strongly immediately before death.

During the last summer the instrument has been in pretty constant use, and with the best results. I have met with but one failure in its operation, which exception is perhaps sufficiently interesting to notice.

The fecundated female of the Burnet moth (*Anthrocera Filipendulæ*) resists the poison in a remarkable manner. A specimen was placed in the apparatus in company with the black spectre-moth (*Mormo maura*). The last large insect was dead in rather less than two minutes, but the former was found to be comparatively lively after the expiration of fourteen hours. It is worthy of remark that during this exposure to the cyanide, oviposition did not take place, but commenced immediately after liberation, exhibiting perhaps a knowledge, on the part of the insect, that such an atmosphere would not conduce to the comfort of the larvæ when excluded from the eggs. Tenacity of life has been repeatedly remarked by others under similar conditions. Many insects will deposit their eggs long after the death, and even stiffening of both head and thorax. These are, doubtless, wise and providential arrangements for ensuring the perpetuation of species. It is, however, to be observed, that the poison is inert, though in a less marked degree, on the male Burnet moth.

An exceptional case to the action of hydrocyanic acid has been lately mentioned, relating to the frog, which, it is said, may be made to swallow the poison by the spoonful, and without inconvenience. Singularly, a cup of tea is certain death to the same animal, from the theine it contains.

I have it, also, from good authority, that the monkey looks upon tobacco-leaf much in the same manner as we do cabbage; at least one individual has been known to eat cigars almost to any extent and to be very partial to them. This is, perhaps, more remarkable than the case of the frog, since the digestive organs of the monkey must more nearly represent those of the human subject, which are not well calculated for such a diet.

In conclusion, a suggestion is made, whether the vapour from cyanide of potassium may not be found efficacious in destroying both moth and larvæ, in cases of stuffed specimens of Natural History, furs, &c. Experiment proves the larva of Tinea pellionella to be incapable of resisting its action, a fact of some value, when we consider how much more difficult it is to destroy the insect in this than in the imago state, and that it will long oppose the action of camphor and other preservations.

It remains only to state, that the vapour capable of such effects on insect life contains such slight traces of hydrocyanic acid, that it has merely a faint and sickly odour, evanescent, and not likely to have a deleterious action on the operator, unless introduced into the lungs in large quantity.

G. B. Buckton.

October 7th, 1854.

Entomological Botany (with more especial reference to the Plants frequented by the Tineina). By H. T. Stainton, Esq.

(Continued from page 4472).

Reseda lutea. Wild Mignonette.
Reseda luteola. Yellow-weed.

Both common, and, from their erect growth, rather conspicuous plants, occurring on chalky or limestone soils: *lutea* is the favourite food of Pontia Daplidice.

Helianthemum vulgare. Common Rock-rose.

This pretty yellow flower is a great ornament to many a dry hill-side, and is equally abundant on the chalk downs in the South and on the slippery sides of Arthur's Seat. In April and July its leaves are mined by the reddish larva of Laverna Staintoni; in May the terminal joint is screwed up by the larva of Gelechia sequax. In June the leaves are mined by a Coleopterous larva, with the name of which I am unacquainted.

Helianthemum polifolium. White Mountain Sun-Cistus.

Near Torquay I have observed this plant, which, except in the white flowers, much resembles the preceding, but I was not so fortunate as to detect any larvæ on it. My stay there was limited to a few hours: perhaps some entomologist may make a longer sojourn there, and be more successful.

Viola odorata. Sweet Violet.
Viola canina. Dog Violet.

These are the principal food of several of our fritillaries,—Argynnis Paphia, Aglaia, Selene and Euphrosyne, and also the still-doubted-as-British Dia.

Viola tricolor. Heart's-ease.

Speyer gives this as the principal food-plant of Argynnis Lathonia, one of our rarest and one of our most elegant British butterflies, and he also cites Spælotis præcox as feeding on it: this larva, according to Rœsel, who figures it (vol. i. pl. 51), feeds in May. Of the larva of Rusina tenebrosa, Guenée remarks that it feeds on the low plants which remain green during the "winter, and especially on the species of Viola."

Polygala vulgaris. Common Milkwort.

This little plant, with its flowers of blue, pink or white, so common on dry pastures, is still unknown to us as the food-plant of any Lepidopterous insect; yet I cannot but think that this arises from our overlooking the plant on account of its insignificance.

Tamarix anglica. Tamarisk.

Common in many parts of the Southern coast, but not at present observed as harbouring any Lepidopterous larvæ. Gelechia Tamariciella, found by Herr Mann near Leghorn, and Agdistes Tamaricis, taken near Strasburg, both derive their names from this genus of plants, but whether appropriately so or not future observations must show.

Saponaria officinalis. Common Soapwort.

This plant, which grows in "roadsides and hedges, mostly near villages," I have never met with. It is fed upon by the larva of Neuria Saponariæ, which eats the leaves, not the seeds; the latter are eaten by the larva of Dianthæcia Capsincola (for a graphic description of the mode of feeding of the Dianthæcia larvæ, I must refer to Guenée's 'Histoire Naturelle des Noctuélites,' vol. ii. p. 17, the passage being too long to transcribe here, and no abstract would do it justice). The larva of Gelechia Fischerella feeds in the terminal shoots of this plant, in May, betraying its whereabouts by the contorted appearance it gives to the head of the plant. In September and October the larva of Coleophora Saponariella feeds on the leaves, in small, cylindrical, nearly straight cases: these larvæ hybernate nearly full fed, but feed a little in the months of May and June of the following year.

Silene nutans. Nottingham Catchfly.

Common in many parts of the country, on chalk and limestone. Of Dianthæcia albimacula there is still, I believe, only a single British specimen: bearing in mind what Guenée remarks of the habits of the larvæ of this genus, and the ease with which they may be found by lamp-light, his observation with reference to this species, "not rare wherever the Silene nutans grows, on which plant the larva feeds," is of considerable importance. Mr. Harpur Crewe has found the larva of D. carpophaga feeding on the seeds of this plant.

Silene Otites. Spanish Catchfly.

Occurs in sandy and gravelly fields, in the Eastern counties. It is on this plant that Coleophora Otitæ feeds in the larva state: it is probable that the larvæ feed on the seeds in the autumn (see Zeller in 'Linnæa Entomologica,' iv. 348), but it is certain that they feed on the under side of the lowermost leaves in the spring: the case is cylindrical, straight, and fully half an inch long. The entomologists of Norfolk and Cambridgeshire should seek for it.

Silene inflata. Bladder Campion.

Abundant on dry chalky and sandy banks, and well known as one of the flowers most attractive to moths. It is fed upon by the larva of Neuria Saponariæ; and the larvæ of Dianthæcia Cucubali, capsincola and carpophaga feed on the seeds. I believe the larva of Eupithecia venosata also feeds upon the young seeds. The leaves are frequently mined by a Dipterous larva. The larva of Luperina luteago feeds in the stem and roots, in July and August.

Silene maritima. Sea Bladder-Campion.

From the masses in which this plant grows on our coasts, it seems extremely probable that several species of larvæ should feed on it. I have repeatedly searched on it at Dawlish, but, with the exception of the Dipterous larva already mentioned as feeding also on S. inflata, I have met with no larvæ whatever.

Lychnis Viscaria. Red German-Catchfly.

A rare plant in a wild state, growing on dry rocks, near Edinburgh and in other parts of Scotland. A double variety was formerly not uncommon in gardens, but has now become rather old-fashioned. It was in the terminal shoots of this plant that Mr. Logan met with the larva of a new species of Gelechia somewhat resembling fraternella, for which he proposes the name Viscariella.

Lychnis Flos-cuculi. Ragged Robin.

Very common in damp meadows: it is fed upon by the larvæ of Dianthæcia Cucubali and conspersa.

Lychnis vespertina. White Campion.
Lychnis diurna. Red Campion.

Neither plant is rare, and the latter in many places is excessively abundant: it grows very freely at Dawlish, where I have observed the leaves mined by some small Dipterous larva. Speyer enumerates, as feeding on these plants, the larvæ of Euthemonia Plantaginis, Dianthæcia Cucubali, capsincola and compta, Camptogramma bilineata and Gelechia Moritzella: this last we find, from Herr Moritz's observations in Treitschke (x. 3, 215), feeds gregariously on their flowers and seeds, at the end of June and beginning of July.

Spergula arvensis. Corn Spurrey.

A common plant in corn-fields, especially on a sandy soil, and readily recognised by its linear leaves and small purple flowers: it is extremely probable that it will be found to afford nourishment to some

Gelechia larva, but at present we are not acquainted with any which feeds upon it.

Alsine. Sandwort.

There are several species of this genus, but none are at present known as the food-plant of a Lepidopterous larva.

Stellaria media. Common Chickweed.

This little plant ornaments many a waste piece of ground, more especially during winter, with its mass of green foliage and small white flowers: in our climate it is a true evergreen, and probably on that account has been observed as harbouring very many of the polyphagous larvæ, several of which are enumerated by Speyer. Of the Micro-Lepidopterous larvæ the only one hitherto observed in it is Gelechia fraternella, which has sometimes been found concealed in the terminal shoots.

H. T. STAINTON.

Mountsfield, Lewisham,
September, 1854.

(To be continued).

Note on the Honey Buzzard in Norfolk.—Another fine specimen of this bird, in nearly adult plumage, was killed at Holkham about the 14th of September. A keeper, having observed a large bird rise from a bank near a wasp's nest, set a trap, and, returning soon after, secured the prize.—*H. Stevenson; Norwich, October* 20, 1854.

Occurrence of Rare Hawks near Blandford.—A magnificent adult male specimen of the honey buzzard (*Falco apivorus*) was brought me, on the 21st ultimo, by the gamekeeper of J. Oldham, Esq., of Kisworth, near here, where it was shot by him on the previous day: this is now the fourth occurrence of this bird in the neighbourhood; one killed at Grange, near Wareham, and now in the possession of the Rev. N. Bond, of Grange; one killed also near Wareham, by Mr. T. Dugdale, of that place, and, without much respect for Ornithology, given to his ferrets; and another killed also, in the same neighbourhood, by Mr. Bennett, of Wareham, and now in the possession of J. H. Calcraft, Esq., of Rempstone, in the Isle of Purbeck: this last was killed in 1852; the two former some years previously, but I do not know the exact date. A fine adult female of Montagu's harrier (*Falco cineraceus*) was also shot by Mr. Oldham's gamekeeper some time during this last summer, and is now in the possession of the Rev. T. House, of Anderson, near Blandford. Two beautiful specimens of the peregrine falcon have also been killed in this neighbourhood lately: one, here, a very old female, was trapped at the remains of a teal it had just struck down, and is now in my own possession; and the other, the finest old male I ever saw, was shot on Lord

Portman's property, at Bryanston, and is now in the possession of Mr. Shipp, of Blandford.—*Octavius Pickard-Cambridge; Bloxworth House, Blandford, October* 6, 1854.

P.S.—At this moment, as I have just finished writing, the keeper of Mr. Dray's decoy, on the heath between this and Wareham, has brought me in a beautiful old male peregrine falcon, trapped yesterday: this bird is so old as to have the throat and a good deal of the breast almost entirely without markings, which is, I believe, a sure sign of age.—*O. P.-C.*

Occurrence of Sylvia galactotes of Temminck on the South Downs, near Brighton, in Sussex.—As G. Swaysland, a bird-stuffer, of Cranbourne Street, West Street, Brighton, was driving on the South Downs, about six miles from Brighton, near a part of the Downs known as Plumpton Bosthill, he noticed a bird which he at first took for a cream-coloured variety of the nightingale. Having no gun he proceeded about four miles to obtain one, and, returning to the spot, found the bird about twenty yards from where he first observed it. It was very wary, flying always to the further side of some furze-bushes, and settling on the side furthest from him, mounting into the air some fifteen yards. Swaysland describes its flight as resembling that of the young of the red-backed shrike. He at last got a shot at about forty yards, and killed it: this was on the 16th of September last. The bird, on dissection, proved to be a male, and would shortly have moulted, one or two young feathers of the primaries having made their appearance on each wing: these are darker than the old ones. The feathers, also, on the back and tail, especially the central ones of the latter, are much worn. I borrowed the bird and sent it to Mr. Yarrell, who kindly sent me the following references, stating also that he was not aware of its having previously occurred in Britain:—The Sylvia galactotes is described in Temminck's Man. d'Orn. vol. i. p. 182, and figured in Werner's 'Illustrations of Temminck,' and by Gould in his 'Birds of Europe,' pl. 112, vol. ii. It is No. 146 on page 149 of Prince Bonaparte's 'Conspectus Avium Europæarum,' and is mentioned in Degland's 'Ornithologie Européen, vol. i. p. 367.—*William Borrer, jun.; Cowfold, Sussex, October*, 1854.

Occurrence of the Rose-coloured Pastor (Pastor roseus) *in Derbyshire.*—One of these rare and prettily marked birds was shot near the Holy Well, at the village of King's Newton, on the 16th of September. It was discovered by Mr. Peter Gregory, a market-gardener, whilst feeding on the ground, in a field much frequented by starlings, and where I observed one, as recorded in the 'Zoologist' (Zool. 2560), in 1842. It is evidently a young bird, and the rose colour is much more delicate than in the figure of the bird in Morris's 'British Birds.' It is now in my own possession.—*John Joseph Briggs; King's Newton, Swarkeston, Derbyshire, October*, 1854.

Poisonous Effects from Cherry-Stones.—A somewhat singular occurrence has lately come to my knowledge of the injurious effects to young pheasants occasioned by eating cherry-stones; but I will first mention the very serious consequences which some years ago befell a biped of my acquaintance, from the same cause. This young friend, who had come to London to see sights and amuse himself by visiting Richmond, Greenwich, and other neighbouring places of enjoyment frequented by the pent-up citizens of London, went one day up the Thames, in a boat, as far as Shepparton, a quiet and secluded spot, where anglers were much accustomed to resort in the summer months: on his way there this young gentleman had occasion to pass the several market-gardens bordering on the banks of the Thames, and well stocked with fruit trees of almost every description, amongst which cherries and plums predominated: these were far too tempting to be overlooked by one of his age, and who had at all times an appetite many a quadruped might envy in vain; he accordingly put ashore, and bargained with the unfortunate owner of the garden to have three hours' run upon the fruit for eighteen-pence, which, according to average circumstances, would have been no such bad arrangement for the latter, if the former would have taken a reasonable proportion of gooseberries, currants, and other common fruit, but his mind was exclusively bent upon the full and luscious-looking cherries, and on these he fell with a will. Whether he occupied the whole of the three hours I am ignorant, but it turned out in the end that the young man had economized his time as much as possible by eating the stones as well as the fruit: the consequence was a most severe constipation and inflammatory attack, which required the attendance of a physician in the neighbourhood, and that I should be sent for from London, as the young gentleman's recovery was thought to be almost hopeless: however, after two days and nights of excruciating pain he was so far relieved as to be able to be removed back to London, but it was a considerable time before he looked with a favourable eye on a cherry again: the report of the physician, who was most kind and attentive, was, that he had never met with a similar case of voracity, and that he conscientiously believed the quantity eaten, from subsequent appearances, must have fully equalled, at the very least, a bushel or a bushel and a half of cherries! A friend this season desired his keeper to place a coop, with a hen and a brood of young pheasants, at the end of his orchard, where various kinds of fruit trees offered them a hasty retreat; but after the young birds had been left there a few days, first one, then a second, and so on, were found lying dead near the coop, with no apparent outward injury to account for their deaths: at length, as all the brood seemed likely to follow a similar fate, the gentleman desired two or three of the dead pheasants to be opened, and, on doing so, their craws were found greatly distended and entirely full of cherry-stones, a cherry-tree being just inside the coop: the remainder of the brood were removed to a distant spot, and all thrived and did well. There can therefore, I think, be no doubt that the poisonous effects and indigestible nature of the cherry-stones must have caused the death of these young pheasants, though a full-grown pheasant might perhaps have taken but little harm from them, unless eaten in great quantities. My young friend's fate had very nearly been the same as that of the pheasants, but he happily escaped. —*W. H. Slaney; Hatton Hall, October* 17, 1854.

Occurrence of Schinz's Tringa, the Hawfinch and White-fronted Geese at Scilly. —Mr. Jenkinson writes me word that a specimen of the rare Tringa Schinzii was shot at St. Mary's, Scilly, last week; that a hawfinch was seen in Mr. Smith's gardens; and that several white-fronted wild geese were shot.—*Edward Hearle Rodd; Penzance, October* 17, 1854.

Occurrence of the Crane (Grus cinerea) *in Sussex.*—On the 19th of this month I saw, at the Museum at Chichester, a specimen of the crane, which had been shot the day before at Pagham. It was in good condition, and apparently an immature female, the elongated plumes on the sides consisting of only two or three feathers, and the head and neck being much tinged with rusty brown. This was after a moderate gale from the west.—*Wm. Borrer, jun.; Cowfold, Horsham, Sussex, October,* 1854.

Occurrence of Richardson's Skua (Lestris Richardsonii) *at Lynn.*—A young specimen of this bird was shot the other day in the estuary of our river, the Ouse. It measured, from the tip of the bill to the tip of the longest feather in the tail, 17 inches;

extent of wings, 37 inches; from flexure joint to the end of longest primary, $11\frac{1}{2}$ inches; beak, 1 inch; gape, 2 inches; tarsus, $1\frac{6}{10}$ inch; longest toe, $1\frac{4}{10}$ inch; claw, $\frac{3}{10}$ inch. The plumage as follows: bill lead-colour; nail black; head dark brown, feathers edged with wood-brown; back of neck buff-brown; back umber-brown, feathers edged with lighter brown; tertials and secondaries umber-brown, tipped with light brown; in some of the feathers the tips are nearly white; primaries, outer web black, the tip half brownish black tipped with light brown, the basal half white and shafts white; tail-coverts umber-brown, broadly margined with clove-brown; tail-feathers, part brownish black, the basal half white, two middle feathers about half an inch longer than the side ones; throat light brown, with longitudinal marks of dark brown; breast buff-brown, with transverse bars of darker brown; under tail-coverts clove-brown, with two bars of umber-brown on each feather; tarsus lead-colour, the base of the toes tinged with flesh-colour, the rest of the toes and web black. The pomarine skua much resembles this when in the same immature plumage, but the specific differences are in the measurements, the pomarine being larger, and the tips of the primaries in Richardson's skua being light brown.—*Edward L. King; Lynn, Norfolk, October* 5, 1854.

Occurrence of the Pomarine Skua (Catarractes pomarinus) *in Derbyshire.*—An individual of this rather rare skua has recently been obtained in Derbyshire, and under somewhat curious circumstances. On September 23rd a strange bird was observed by Thomas Cox, Esq., near the village of Burnaston, in company with some rooks. The stranger was evidently wishful to form companionship with the gentlemen in sable, but the desire was not mutual, and consequently he was driven about by them with considerable violence, until he ultimately fell to the ground, and was picked up by Mr. Cox. The bird proved to be the pomarine skua. It has been most admirably preserved by Mr. Cook, Museum, Derby. It may be, perhaps, worthy of remark, that Mr. Cook has generally in his possession several of the rarer feathered tribes, and if any subscriber to the 'Zoologist' passes through Derby he will, I am sure, be happy to show them to him.—*John Joseph Briggs; King's Newton, Derbyshire, October*, 1854.

Appearance of a Fish supposed to be the Fox Shark (Carcharias vulpes) *off Scarborough.*—About the middle of September, being on a visit to Scarborough, I went out with five gentlemen, in a small boat, to fish for whitings. When a mile from shore, the boat was anchored and the sport commenced. In a short time the boatman at the helm became much alarmed, frequently exclaiming that he had seen a monster fish as long as the boat, and he wanted immediately to pull to shore. The matter was at first treated by the party as a ridiculous story which had been invented by the man to excite their curiosity. In a few minutes, however, up started the man upon his legs and exclaimed "There he is!" at the same time pointing towards the fish, which had just risen to the surface of the sea. At that time the animal was about a hundred yards from the boat, and appeared at that distance about twelve or fourteen feet long. He afterwards came nearer, and he was estimated by the party at eighteen or twenty feet. His manners were somewhat curious and interesting. He would come up to the surface of the sea, and lie with the upper part of his head back, from which a fin protruded (about two feet long), and the upper part of his singular tail out of water. After waiting perhaps a couple of minutes, a fish would catch his eye, and away he scudded after it with remarkable rapidity, leaving a track of white foam to mark the course which he had taken: then he was invisible for a few minutes; again appeared and exhibited the same actions. That he was not a specimen of the common shark or any of the larger common marine fishes (most of which I had seen) I felt certain, and, after a minute search in Yarrell's 'British Fishes,' I discovered that he resembled only one figure, viz., that of the fox shark, and I have no doubt that he was a specimen of this rare and singular fish. On the Scarborough coast herrings were unusually numerous about that period, and probably he was induced to venture so near the shore in pursuit of this his favourite food. Our boatman had been a fisherman from his youth, and had taken some curious fishes, but he had never seen a similar fish in any of his voyages. Mr. Yarrell, upon the authority of Mr. Couch, says, "It is not uncommon for one of these animals to approach a herd of dolphins that may be sporting in unsuspicious security, and by one splash of his tail on the water put them all to flight, like so many hares before a hound." It appears, from that author's account, that very few have been seen or taken off the shores of this country.—*John Joseph Briggs; King's Newton, Derbyshire, October* 6, 1854.

PROCEEDINGS OF SOCIETIES.

ENTOMOLOGICAL SOCIETY.

October 2, 1854.—EDWARD NEWMAN, Esq., President, in the chair.

Donations.

The following donations were announced, and thanks ordered to be given to the donors:—'Mémoires Couronnés et Mémoires des Savants Etrangers,' tome xxv.; 'Bulletins de l'Académie Royale des Sciences et des Beaux Arts de Belgique,' tome xx. 3me partie, tome xxi. 1re partie; 'Annexe aux Bulletins,' 1853—1854; 'Annuaire de l'Académie Royale des Sciences, des Lettres et des Beaux Arts de Belgique,' 1854; all presented by the Academy. Zuchold's 'Bibliotheca Historico-Naturalis, Vierter Jahrgang, 1 Heft. January to June, 1854; by the Author. Guérin's 'Revue et Magasin de Zoologie,' 1854, No. 8; by the Editor. 'Proceedings of the Royal Society,' vol. vii. No. 6; by the Society. The 'Literary Gazette' for September; by the Editor. The 'Athenæum' for September; by the Editor. The 'Journal of the Society of Arts' for September; by the Society. The 'Zoologist' for October; by the Editor. 'Annales des Sciences Physiques et Naturelles d'Agriculture et d'Industrie,' tomes iv. and v.; by la Société Impériale d'Agriculture &c. de Lyon. 'Mémoires de l'Académie Impériale des Sciences, Belles-Lettres et Arts de Lyon;' 'Classe des Lettres, nouvelle Série,' tome 2me; by the Society. 'Annales de la Société Linnéenne de Lyon,' nouvelle Série, tome 1re; by the Society. 'Opuscules Entomologiques,' par E. Mulsant, cahiers 2, 3 and 4; by the Author. 'Mélanges Entomologiques,' par B.

P. Perroud, 2me partie; by the Author. 'Die geographische Verbreitung der Europäischen Schmetterlinge in Anderen Welttheilen,' von G. Koch, Leipzig, 1854; by the Author. 'Käferfauna für Nord und Mitteldeutschland,' 3 and 4 Lieferung, von M. Bach, Coblenz, 1854. Specimens of Formica cunicularia, ♂ and ♀, Myrmica ruginodis, M. scabrinodis, M. lævinodis, M. cæspitum and M. flavidula; by Mr. F. Smith. A piece of larch wood, from an old post, showing marks of the mandibles of wasps in biting off particles for building materials; by W. H. Watkeys, Esq., Stroud.

Exhibitions.

Mr. Stevens exhibited the first known British specimen of Goniodoma auroguttella (a species beautifully figured and described by Fischer-von-Röslerstamm), lately taken by him while sweeping on the banks of the Yar, in the Isle of Wight; specimens of a new Miana, captured near Darlington; a variety of Apatûra Iris and a hermaphrodite Thecla Quercûs, taken near Rochester; and a new species of Eccoptogaster, found by Mr. Weaver in birch stumps at Rannoch.

Mr. Foxcroft sent from Perthshire, for exhibition, the following Lepidoptera, recently taken there by him:— Phibalapteryx lapidata, Depressaria ciniflonella, Leptogramma Scotana, and Cheimatobia autumnaria.

Mr. Douglas exhibited a specimen of Crambus Cassentiniellus, taken by Mr. J. Hemmings on the downs near Brighton, remarking that it was not only a species new to Britain, but is only known to have been captured in Italy by Professor Zeller. He also exhibited a new Nepticula, bred by Mr. Weaver, in Scotland, from leaves of Vaccinium Vitis-Idæa, for which he proposed the name N. Weaveri; and a specimen of the scarce beetle Dyctiopterus minutus, found by himself, on the 17th of October, on the palings of Addington Park.

Mr. Stainton exhibited leaves of various plants, each kind containing larvæ of different species of Nepticula; also leaves of hawthorn, containing larvæ of the beetle Ramphus pulicarius.

Motion communicated to Seeds by Insects.

Mr. Westwood said that Sir William Hooker had sent him some seeds received from the West Coast of America, which had excited some curiosity by jumping about: this motion was caused by an insect-larva in each of the seeds, and after a further examination he hoped to communicate some more particulars, and to obtain the name of the plant producing the seeds. Among them he had found an Ichneumon, which was probably a parasite on the enclosed larvæ.

Mr. Janson doubted if larvæ, perfectly enclosed as these were said to be, could possibly give motion to the seeds; but the President said that Réaumur, as cited by Kirby and Spence, had recorded a similar instance, and Mr. Curtis said he had verified Réaumur's statement, the insects being larvæ of Bruchi.

Economy of Grapholitha corollana.

Mr. Douglas read the following translation of part of an article by Professor Zeller, in the 'Zeitschrift für Entomologie des Vereins für Schlesische Insekten-Kunde zu Breslau,' No. 23, 1852 (published in 1854), observing that the species was not unlikely to occur in England.

"GRAPHOLITHA COROLLANA, Hub. fig. 282.
"*Tortrix corollana*, Frölich, Tort. Wurtembergiæ, p. 91, 218.
"*Graphol. corollana*, Duponch. Cat. p. 306."

After some critical remarks on the species, he says,—

"According to Frölich this Tortrix flies on flowers in May and June, but my experience is entirely contrary to this statement. I might assert that this Tortrix does not frequent flowers at all: it generally flies but little, and therefore is so seldom met with. Near Berlin I once caught several specimens on the 9th of May, towards evening, on the trunks of moderately thick aspens, and two of them were paired. Afterwards, in Frankfort on the Oder, on the 17th of March, from branches of aspen, which also contained larvæ of Saperda populnea, and which I had placed in water in a window exposed to the sun, I reared a fine female, which sat upon the young aspen-leaves. I then thought the larva had lived in the buds, and sought therein accordingly, but found only one larva, which I carefully described, but from which I only bred Penthina dealbana. At Glogau, on the 11th of May, 1851, on a young aspen, I caught a male which thus early was somewhat injured, going to prove that the time of flight could not extend far into the second half of the month, that consequently the indication of 'June' has not much probability, and, as all the allied species appear only once a year, there is no reason to think there is a second brood of this. In the year 1852 I procured, from two Coleopterists of this place, branches of aspen, in which were Saperda larvæ. On examination of the knots on the branches I noticed, in a defective part, an empty pupa-case projecting from the wood, and it immediately occurred to me that it might very likely belong to corollana. I therefore next examined other injured branches, and when I saw some larva-excrement hanging out of one I became certain that the larva of corollana lived in the wood of aspens. Only one of these branches furnished me with a moth, a male, which came out in the morning of the 11th of May. The branch was, underneath a twig, somewhat knotty and decayed. I had cut into it, in April, just down to the cavity wherein the pupa lay, in a web of powdered wood, with the head upwards, very lively, and still quite yellow. I fastened the pieces of the branch together again, and looked at it from time to time, and thus observed how the pupa became coloured. As it had lain with its head within the wood, I feared that, as in consequence of my cutting into the wood it had fallen out, I had replaced it in an unfavorable position, but this fortunately did not appear to have been the case. I saw, on the 11th of May, the pupa had worked itself out through a decayed part hitherto unobserved by me, from which it was almost entirely suspended; it became thus all but exposed; still it could make use of the spines of the abdomen, by means of which it had doubtless burst through the place of its exit, which had been prepared beforehand by the larva. At first I could not find the moth, and on shaking the box it did not fly off. At last I saw it sitting on a small bit of the wood, with its wings in a convex, roof-shaped position. In consequence of my having disturbed it, in my endeavours to put it into a small glass, it became very lively in the sunshine. A second fine example of corollana, which came out with the Saperda, I afterwards received from Herr Capt. Quedenfeld, one of the above-mentioned Coleopterists.

"It appears to me, from the foregoing details, that this moth is not so scarce as hitherto supposed, and that it may be obtained by breeding. For this purpose both old and young lower branches of aspens should be examined in the winter and spring, attention being directed to those having the knots of Saperda larva, as both these

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TO CORRESPONDENTS.

A number of valuable contributions (especially entomological) unavoidably stand over: all of them will appear (together with title and index for the year) in the December number.

Just ready for the Press,

THE FERN FLORA OF THE NORTH, comprising descriptions and localities of all the European, North American and Asiatic Ferns, noticed by Koch, Fries, Newman, Asa Gray and Ledebour. By Edward Newman, F.L.S., &c.

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